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ABSTRACT

One objective of the research was to identify career ladders with the greatest potential for improving retention. This study revealed that a regression model, which takes into account airmen career status and months of service while holding constant aptitude differences, can be used to display cross-sectional attitude data in a longitudinal fashion. From the displayed regression profiles, it is feasible to infer career-ladder relationships between job attitudes and tenure or career decisions. A characteristic increase in job attitude immediately after the reenlistment decision point in cross-sectional data reflects a "residualization process" whereby those dissatisfied with their jobs tend to leave the Air Force while more satisfied airmen remain. The increase reflects the impact of job attitude on career decisions and is not due to alternative "dissonance theory" or changes in intrinsic motivation explanations. The cross-sectional profiles provide a means of identifying specialties with the greatest potential for job reengineering where the goal is to positively improve retention through providing progressively more satisfying jobs. (TA)

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AFHRL-TR-76-46

AIR FORCE HUMAN RESOURCES LABORATORY

LONGITUDINAL INFERENCES OF JOB ATTITUDE AND TENURE RELATIONSHIPS FROM CROSS-SECTIONAL DATA

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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By

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Lackland Air Force Base, Texas 78236

July 1976
Interim Report for Period 1 October 1974 – 31 March 1976

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One objective of an Air Force job satisfaction research program is the identification of career ladders with the greatest potential for improving retention. This study revealed that a regression model (which takes into account airmen career status and months of service while holding constant aptitude differences) can be used to display and interpret cross-sectional attitude data in a longitudinal fashion. The cross-sectional profiles provide a means of identifying specialties with the greatest potential for job reengineering where the goal is to positively influence career decisions through providing more satisfying jobs.

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PREFACE

This research was conducted under Project 7734, Development of Methods for Describing, Evaluating, and Structuring Air Force Occupations; Task 773405, Derivation of Methods to Provide for Career Progression and Development of Air Force Personnel; Work Unit 77340501, Impact of Work-Related Factors on Job Satisfaction and Career Decisions. Recognition must be given to Dr. Raymond E. Christal for his role in formulating the regression model used in this report, to Dr. Joe T. Hazel for his editorial suggestions, and to Mrs. Maria M. Courtney for typing the manuscript.

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LONGITUDINAL INFERENCES OF JOB ATTITUDE AND TENURE RELATIONSHIPS FROM CROSS-SECTIONAL DATA

I. INTRODUCTION

A comprehensive job satisfaction research plan has evolved as an outgrowth of the USAF Occupational Research Program. One long-range goal of the plan is retention of qualified personnel which requires identification of career ladders in which there is the greatest potential for improving retention. A proposed procedure for identifying potential ladders (Christal, 1974; Gould, 1974) developed regression lines for several specialties to show the relationship between specific measures of job attitude and the length of time respondents have been on active duty. Resulting profiles displayed the attitudes of individuals who were in different stages of their careers and had responded to the attitude question on the same date; thus representing a cross-sectional snapshot of attitudes by tenure group. These cross-sectional profiles were then interpreted in a longitudinal fashion to infer the job attitude, time-in-service, and career decision relationship. Validity of the longitudinal inferences was not demonstrated through empirical means, but relied on logical explanations. This report extends the model's application, describes the obtained regression curves, and uses longitudinal data to investigate the validity of making such longitudinal inferences from cross-sectional attitude data.

Air Force occupational surveys administered since September 1966 have routinely contained two job attitude questions: job interest, and perceived utilization of talents and training. Responses of over 200,000 airmen in 195 of 236 career ladders are currently available. The attitude questions (Figure 1) asked respondents to indicate, on 7-point scales, their job interest from "extremely dull" to "extremely interesting" and extent to which their jobs utilize their talents and training from "not at all" to "perfectly." The job interest and perceived utilization scales are the attitude criteria used in this report.

YOUR RESPONSES TO THE FOLLOWING TWO ITEMS WILL BE HELD IN STRICT CONFIDENCE AND WILL BE USED FOR RESEARCH PURPOSES ONLY

I FIND MY JOB:	MY JOB UTILIZES MY TALENTS AND TRAINING:
1 ☐ EXTREMELY DULL	1 ☐ NOT AT ALL
2 ☐ VERY DULL	2 ☐ VERY LITTLE
3 ☐ FAIRLY DULL	3 ☐ FAIRLY WELL
4 ☐ SO-SO	4 ☐ QUITE WELL
5 ☐ FAIRLY INTERESTING	5 ☐ VERY WELL
6 ☐ VERY INTERESTING	6 ☐ EXCELLENTLY
7 ☐ EXTREMELY INTERESTING	7 ☐ PERFECTLY

Figure 1. **Job interest and utilization of talents and training attitude scales.**

An earlier study (Gould, 1972) compared attitudes of personnel in 97 career ladders and concluded that most airmen found their jobs interesting and their talents well utilized. However, extensive attitude differences were found between career ladders and among individuals within ladders. For example, the percentage of airmen reporting very little or no utilization of talents and training ranged from 5% of the Dental Laboratory Technicians to 52% of the Pavements Maintenance Specialists, and there were few common characteristics among those ladders with the highest percentage of workers reporting poor utilization.

Several career-ladder specific studies (Gould & Christal, 1971; Stacy, 1973; Stacy & Hazel, 1975) found few common correlates of dissatisfaction across career ladders. The most consistent findings were

that aptitude is negatively related to satisfaction, amount of variety and difficulty level of tasks performed are positively related to satisfaction, and months of total active Federal military service (TAFMS) is negatively related to satisfaction for airmen in their 5th through 48th month of service and positively related thereafter.

The TAFMS/satisfaction relationships are of particular interest because they imply that airmen become increasingly dissatisfied as they approach the reenlistment decision point at the 48th month and that airmen who are in their 49th or later month; i.e., those who made a positive reenlistment decision, find their jobs increasingly more satisfying. There is usually a large positive shift in job attitude from the 48th to the 49th month. The jump or gap between the 48th and 49th month suggests two possible interpretations. Either (a) some type of job attitude change occurs immediately after a commitment is made for "four more years" of service, or (b) the gap is due to a "residualization process" where those finding their jobs dull or undemanding tend to leave the Air Force with the more satisfied airmen remaining after the 48th month. If the latter case is true, the size of the gap indicates the impact of job attitude on the career decision. Some studies making the first interpretation that attitudes change after the career decision is made will be reported followed by studies supporting the second interpretation that attitude effects the career decision.

Friedlander (1966) obtained job attitude/tenure relationships for high performers in civilian industrial settings. Plots of the relationships were similar to plots of the Air Force data but the civilian tenure/satisfaction relationships were more U-shaped. In industrial settings, there is no specific periodic career decision point, as in every four years, and hence the discontinuity shown between the Air Force 48th and 49th months is not present. Friedlander (1966) attributed the ultimately upward trend of the U-shaped relationship to changes in intrinsic motivation and external rewards such as promotion and increased responsibility. His interpretation from an industrial setting could support a conclusion that an attitudinal change after reenlistment in an Air Force setting accounts for the jump between the 48th and 49th months.

Summarizing other studies, Friedlander (1966) and Broedling, Wiskoff, and Herbert (1975) suggest that cross-sectional attitude change data can reflect the process of cognitive dissonance. Cognitive dissonance theory (Festinger, 1957) contends that attitudes change to make some past behavior, in this case the reenlistment decision, consistent with the present situation to reduce internal or intrinsic conflict. If the process of cognitive dissonance is producing a more positive job attitude after the reenlistment decision, then the attitude change could be the result of the reenlistment decision and not vice versa.

Recent Air Force studies (Alley & Gould, 1975; Hickerson, Hazel, & Ward, 1975) support the second notion that the pre- and post-reenlistment attitude discontinuity does illustrate the relationship between job attitude and career decision. Alley and Gould (1975) traced approximately 55,000 first-term airmen respondents who had been surveyed at various years of service prior to reaching the actual reenlistment decision point and determined their actual reenlistment decisions. Using an in/out dichotomous 1=reenlisted, 0=discharged criterion, they found small but significant ($p < .01$) validity coefficients between actual reenlistment decisions and job interest, and perceived utilization of talents and training. Additional analyses, not included in the Alley and Gould (1975) report, predicted career decisions from job interest and perceived utilization responses for 30 specific career ladders having the greatest number of cases.[1] The prediction models took into account TAFMS categories of the respondents at the time their attitude statements were made. Multiple correlation coefficients (R's) for predicting the in/out criterion ranged from .12 to .31 for job interest and .11 to .30 for talents and training. These results demonstrate that job attitude is related to career decisions and that the magnitude of the relationship varies by career ladder. One of the few consistent findings in job satisfaction literature, civilian and military, is the positive relationship between satisfaction and tenure (Tuttle & Hazel, 1974).

Christal (1974) refers to the pre- and post-reenlistment attitude discontinuity as the "impact gap." He cites one additional support for the thesis that the "impact gap" reflects the job attitude/career decision relationship and is not due to changes in intrinsic motivation or so called "cognitive dissonance" processes after reenlistment. Christal found that several of 142 career ladders analyzed showed no "impact gap" between the 48th and 49th month when attitude/tenure profiles were displayed.

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[1] Regression analyses were conducted by this author but were not reported by Alley and Gould (1975).

Possibly both job attitude/career decision relationships and "cognitive dissonance" are jointly, though differentially by career ladder, producing the obtained job attitudes increase between the 48th and 49th month of service. To the extent that "cognitive dissonance" changes are effecting the 48th to 49th month gap, the Christal (1974) and Gould (1974) interpretations of the gap as reflecting the probable "impact" of job attitude on reenlistment decisions are in error. With a goal of modifying jobs or career ladders so airmen will favor the Air Force as a career choice, Christal (1974) and Gould (1974) both contend that those ladders which show the greatest attitude impact on career decisions are the most likely to yield equitable returns for research efforts expended. The regression model used to identify career ladders for in-depth study, the types of attitude/tenure relationships obtained, and the inferences drawn will be described in the Section II followed by a test of the assumptions which are made in interpreting the model's results.

II. IDENTIFYING CAREER LADDERS FOR IN-DEPTH STUDY

This section describes the regression model which Christal (1974) and Gould (1974) used to display cross-sectional attitude data in a longitudinal fashion and discusses interpretations of the job attitude/TAFMS profiles. Section III will address the validity of the longitudinal interpretations.

Regression Model

The method developed to infer probable impact of job attitudes on reenlistment decisions used regression lines to depict the attitude of airmen according to their TAFMS. The regression model took the form $Y = a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7$ where Y was either the job interest or utilization of talents and training attitude criteria and the X vectors were defined as follows:

X_1 = 1 if months of service < 48; 0 otherwise[2] (dichotomous vector)

X_2 = 1 if months of service > 48; 0 otherwise (dichotomous vector)

X_3 = Number of months of service if < 48; 0 otherwise (interaction vector; TAFMS * X_1)

X_4 = Number of months of service if > 48; 0 otherwise (interaction vector; TAFMS * X_2)

$X_5 = (X_3)^2$ (a curvilinear vector)

$X_6 = (X_4)^2$ (a curvilinear vector)

X_7 = Average aptitude index on Airman Qualifying Examination (AQE)

The model permitted development of unique weights for airmen in their first enlistment (weights a_1, a_3, a_5) and for airmen who were beyond their 48th-month of service and had, thus reenlisted at least once (weights a_2, a_4, a_6). The squared terms, X_5 and X_6, were included in the model because the attitude/TAFMS relationships were frequently found to be curvilinear.

A primary risk in interpreting cross-sectional data in a longitudinal fashion is that obtained criterion score differences may have resulted from influences of some historical or concomitant variables rather than being the result of true criterion changes with time. Analyses of airmen acquisitions (Vitola, Mullins, & Brokaw, 1973) have demonstrated real-time differences in aptitude levels. This historical factor and the consistent finding that aptitude is related to job attitude requires that real time differences in the aptitude of airmen acquisitions must be held constant. The average aptitude score, X_7 was thus included in the regression model to hold constant any attitude differences between airmen in adjacent TAFMS month categories resulting from differences in aptitude levels. The average of the four AQE scores was used as the aptitude score since airmen are assigned to specialties according to AQE scores and using an individual AQE index could produce restriction in range problems. Use of the average of four AQE scores makes the assumption that specific AQEs would not significantly add to prediction of the attitude criterion where the average AQE is also available—the assumption was verified during initial model development.

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[2] The model is possible because initial enlistments were for 48 months. Recently, 72-month initial enlistments have become possible and the model will have to be modified accordingly when 72-month enlistees are included in a sample.

Before predicted attitude values are displayed for a career ladder, a restriction that the regression lines are linear and not curvilinear should be imposed on the computing model. This is done by removing the X_5 and X_6 vectors from the original model and comparing the resulting multiple correlation with that obtained by the full seven-parameter model. An F statistic is used to test for significant differences between the full model, which has seven independent predictor vectors, and the restricted model which has five independent vectors. The restricted five-parameter model is used to predict the attitudes if the F is not significant. See Bottenberg and Ward (1963) for an explanation of regression model development and hypothesis testing procedures.

Model Application and Profile Interpretations

At the time of the data analyses, 130,000 cases in 142 career ladders had been combined into a single file and represented all airmen surveyed from September 1966 to November 1971. To demonstrate the regression model, 8,000 cases were randomly selected from the 130,000 cases and full and restricted model regression weights computed for both the interest and utilization criteria. As shown in Table 1, the F test of the full seven-parameter versus the restricted five-parameter model was significant for the interest criterion and the full model was used to develop the predicted attitude values. For the utilization criterion, the F test was not significant and the utilization/TAFMS relationship is accepted as linear rather than curvilinear. The restricted model was used to develop the predicted utilization values. Resulting job interest (Plot A), perceived utilization (Plot B), and TAFMS relationships are shown in Figure 2.

Table 1. **F Tests to Determine if Job Attitude/TAFMS Relationships are Curvilinear or Linear**

Job Attitude	Multiple R: Full Model	Multiple R: Restricted Model[a]	df_1	df_2	F	Significance Level
Interest	.1991	.1971	2	7993	3.20	.05
Utilization	.2471	.2464	2	7993	1.44	NS

[a]Tests hypothesis that relationships are linear.

The regression curves display the expected attitude value of individuals at various months of service. In this case, the expected values were computed for individuals having an average aptitude score of 64.43, the mean aptitude of the 8,000 cases. Therefore, the displayed expected values are for individuals, by TAFMS, who have the group mean aptitude. Interpreted in a longitudinal fashion, the profiles suggest that there is a decline in both interest and perceived utilization as airmen approach the 48th month reenlistment decision point. The jumps or gaps between the 48th and 49th month are believed to reflect the probable impact of job attitude on the career decision. A reasonable assumption is that if there was sufficient job progression for first-term airmen (i.e., jobs requiring increasing technical skills and/or increasing responsibility) their job interest and perceived utilization would not be declining with increased tenure. Another reasonable assumption is that airmen who do experience job progression will have more job satisfaction and be more likely to favor a career in the Air Force.

Figure 3 shows examples of three basic profiles obtained when attitude, in this case, job interest, and TAFMS relationships were displayed for each of the 142 career ladders. Plots A and B depict two versions of the first type of relationship where attitude is decreasing with increased tenure for first-term airmen but is increasing with tenure for career airmen (i.e., shifts between the 48th and 49th months). In the second type of profile, Plot C, job attitude is increasing with tenure for the first-term airmen. Plot D shows the third type of relationship where there is little or no difference in job attitude between first-term and career airmen.

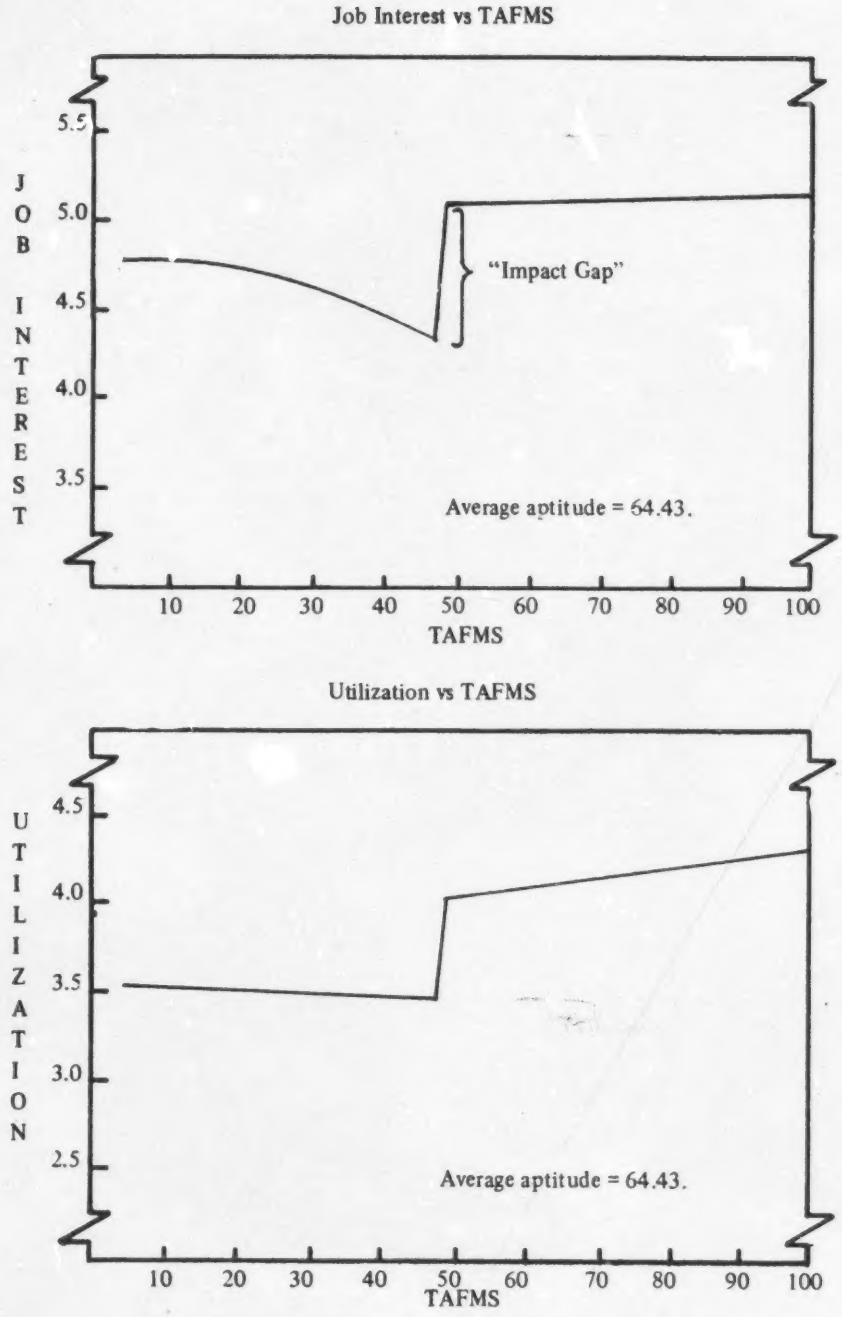

Figure 2. Job attitudes vs TAFMS (holding aptitude constant) for 8,000 cases from 142 career ladders.

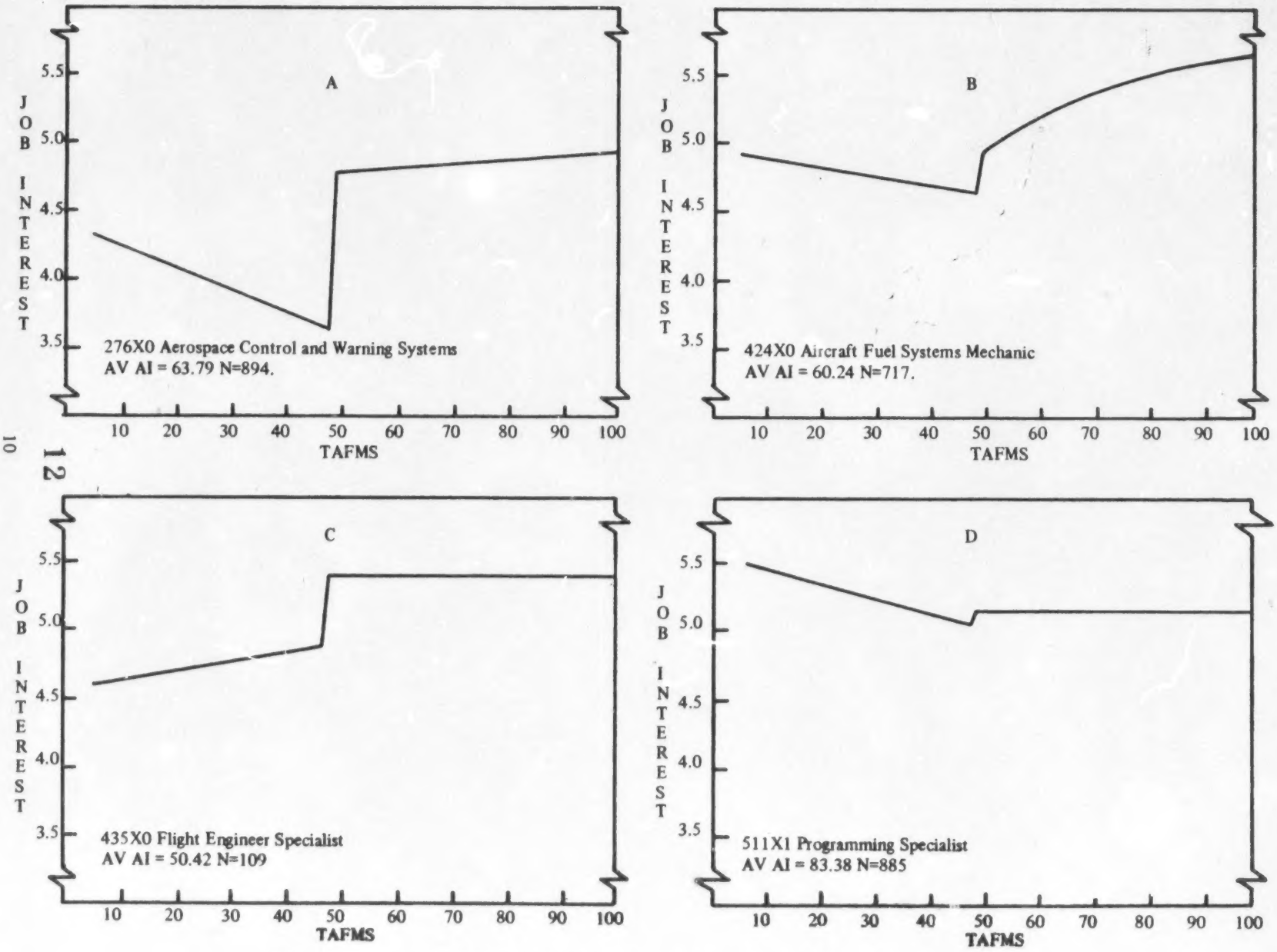

Figure 3. Example profiles obtained when job interest and TAFMS relationships (aptitude held constant) were displayed.

The profile of the Aerospace Control Systems ladder (Plot A) is representative of the most typical relationship. The shape of the profile approximates the radical sign used in mathematics and was thus labeled as a "square-root curve." In the profile, the regression lines represent the predicted job interest scores for airmen with the 894 case sample's average aptitude index (AV AI) of 63.79 according to their months of service (5 to 100). For ladders with this general profile, the size of the gap between the 48th and 49th month, steepness of slope of the lines, and linear/curvilinear nature of the relationships vary between ladders as is shown for the Aircraft Fuel Systems Mechanics (Plot B). The 276X0 ladder in Plot A appears to be a better candidate for in-depth research since job interest is lower and decreases more rapidly as the reenlistment decision point is approached than the ladder in Plot B. Also the "impact gap" is larger. It would be more likely that 276X0 jobs could be reengineered to provide more interesting jobs and produce positively accelerating job interest as the reenlistment decision point is approached.

The 435X0 ladder represents the second basic profile shape (Plot C). If job reengineering is made for the expressed purpose of building job progression into the 276X0 ladder and subsequent job interest is measured, the resulting profile could be similar to that shown for the 435X0 ladder. The 435X0 profile shows a low initial job interest that accelerates positively toward the 48th month and has a limited impact gap.

The third type of profile is shown by the 511X1 Programmer ladder (Plot D). Here, there is a high initial and subsequent level of job interest and little relationship between job interest and career decisions. The 511X1 profile is consistent with the characteristics of the specialty and the civilian employment demand for programmers at the time the ladder was surveyed. Programmers' tasks are very demanding and tend to increase with experience to match the programmers' expertise; there is little or no opportunity for job expansion through external intervention. Further, experienced programmers were in great demand by civilian companies and starting salaries were extremely competitive at the time the survey data was collected. Ladders with profiles such as that of the 511X1 show little potential for job engineering research. If reenlistment problems exist for ladders with this third-type profile, monetary or other benefits rather than job engineering are the most probable solutions.

III. ILLUSTRATIVE LONGITUDINAL VERSUS CROSS-SECTIONAL RELATIONSHIPS

Although some evidence has been cited to support the longitudinal interpretations, validation of the inferences drawn must come from actual longitudinal data (i.e., employing job attitudes obtained from the same airmen in the same fashion, at two different times). In this section example longitudinal job attitude/TAFMS relationships necessary to test the validity of making the proposed longitudinal inferences from cross-sectional data are presented. Then, actual longitudinal profiles are compared to cross-sectional profiles for acceptance or rejection of the proposed method for making longitudinal inferences.

The previously proposed longitudinal interpretations from cross-sectional data concentrated on first-term airmen. The basic underlying assumption of the interpretations is that if the attitudes of those first-term airmen who subsequently reenlist were independently plotted, the attitudes would approach those expressed by career airmen in their 49th month who were surveyed at the same time. Figure 4 shows five hypothetical profiles; one of a cross-sectional sample (Plot A) and four possible relationships that could result if attitudes were displayed for those cases in the sample who subsequently reenlisted. If Plot B is obtained, the assumption is not supported but Plots C, D, or E support the assumption.

In the figure, a cross-sectional random sample of airmen (Plot A) report decreasing attitudes as TAFMS increases to the 48th month and there is large attitude jump to the 49th month. Now, suppose after a period of several years we identified those first-term airmen in the sample who subsequently reenlisted and plotted that group's attitude/TAFMS relationships and compared them to the original total sample. If we obtained Plot C, the reenlisting group had the same basic entry level attitudes as the total sample, including those who did not reenlist, but they had positive increases in job attitudes as TAFMS increased while those who left the service showed decreases. Further, those airmen close to the reenlistment decision point show no appreciable attitude difference from career airmen in the original sample who are at the 49th month. The 49th month attitude levels of the total sample are indicated by the dotted lines. From Plot C, the 48th to 49th month attitude change in the original sample reflects a residualization process where those with more negative attitudes left the service. In plot D, the attitudes of airmen reenlisting

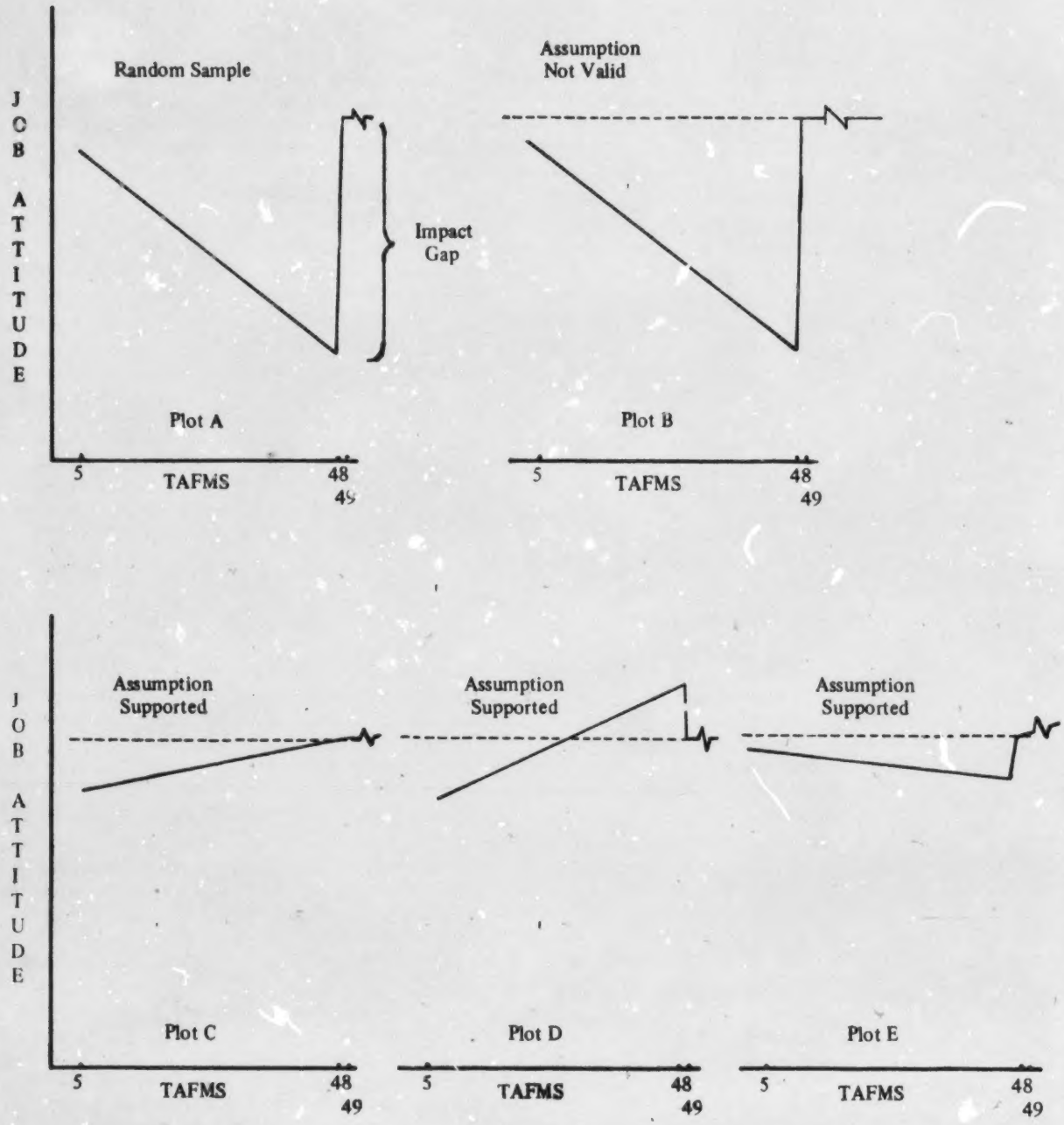

Figure 4. Hypothetical profiles comparing attitude relationships of first-term airmen who reenlisted to a random sample of airmen.

increase from initial levels as the 48th month is approached and actually exceed the levels of the 49th month group. Again, the change after the reenlistment decision point indicates that those with more negative attitudes left the service. The fact that attitudes of airmen about to reenlist exceed those of airmen who have recently reenlisted may be of interest, but does not effect the original assumption of the attitude and tenure relationship. An explanation of the phenomenon will be given in the results section. Plots C and D suggest that some type of job expansion is taking place, at least perceived expansion if not real. In Plot E, a slight decrease in attitude is shown but the decrease is much less than the total sample and again the attitude just prior to reenlisting approximates the attitude of those who have recently reenlisted. The slight decrease in attitude would suggest that job progression is not quite keeping pace with changes in expectations of the incumbents. In Plot E, reenlistment group and original sample differences still account for most of the "impact gap."

If in actual comparisons Plots C, D, and E are obtained and there is no significant attitude change between the 48th month of the first-term airmen who subsequently reenlist and the 49th month of the airmen who were surveyed at the same time but have already reenlisted, we would conclude that for a random cross-sectional sample of airmen the gap between the 48th and 49th month does reflect the association between the specific job attitude and the reenlistment decision. Further, hypothesized "dissonance or intrinsic motivation" explanations for the total sample (Plot A) attitude jump to the 49th month would not be supported.

Another, but similar, way to approach the validity of the longitudinal interpretations is to use the regression model to construct attitude profiles for the entire longitudinal sample whereby each individual is represented twice. For example, in a sample where there is a 39-month interval between surveys, individuals who had 30 months of service at Time 1 would also be represented at the 69th month. If the longitudinal interpretations are justified, the Time 2 attitudes of the first-term airmen in the longitudinal sample will basically be an extension of their Time 1 attitudes and the positive attitude jump at the reenlistment point will not exist. However, if the profile of the cross-sectional sample is replicated by the longitudinal attitude measurements, longitudinal inferences of impact of attitude on reenlistments can not be made from the cross-sectional data. This type comparison of cross-sectional and longitudinal profiles does have two primary limitations: (a) the Time 2 attitudes of the individuals are susceptible to historical events which occur during the Time 1/Time 2 interval, and (b) the predicted attitude profiles for the latter months are difficult to interpret because responses of both Time 1 and Time 2 surveys are represented at these months. For example, if the Time 1/Time 2 survey interval was 48 months, the profile for airmen with 48 months or less service would represent only Time 1 responses, but the profiles for career airmen would represent the TAFMS categorical means of the Time 1 and Time 2 responses. If some unknown historical event intervened to alter the Time 2 attitudes, the resulting Time 1/Time 2 mean profiles could defy interpretation or be very misleading.

IV. EMPIRICAL TEST OF LONGITUDINAL INTERPRETATIONS OF CROSS-SECTIONAL DATA

To evaluate the validity of the longitudinal interpretations, responses of first-term airmen who subsequently reenlisted (longitudinal samples) were compared by career ladder to Time 1 cross-sectional sample responses for seven career ladders. The comparison is easily made because all Time 1 first-term airmen in the longitudinal samples have reenlisted by Time 2. This approach satisfies the basic purpose of the study. To evaluate longitudinal attitude shifts and trends, the full career ladder profiles of the longitudinal samples, where each individual is represented twice, will also be presented. The profiles for the entire Time 2 cross-sectional samples will be presented to aid interpretation of the longitudinal profiles.

The sample was obtained by matching all cases which had been administered surveys during the September 1966 to November 1971 time period. A total of 1,206 cases were found who by chance completed two surveys in the same specialty with Time 1/Time 2 intervals of from 32 months to 45 months depending on the career ladder. Career ladder surveys are generally administered to random samples. The time span was sufficiently long that all airmen in the sample who were in their first enlistment (TAFMS < 49 months) at Time 1 had reenlisted by Time 1. Twenty six percent of the sample or 312 airmen were in their first term at Time 1.

Seven survey groups are represented by the 1,206 cases and are listed in Table 2. Two of the groups, 46XX0 and 671XX, each represent two specific career ladders which, within group, are very similar ladders that were surveyed at the same time using the same Occupational Inventories. The other five survey groups each represent a specific career ladder. The total sample sizes for each Time 1 and Time 2 survey, the number of matched cases in each sample (the longitudinal sample), and the dates of survey are included in the table.

Table 2. **Dates of Survey and Sample Sizes for Career Ladders Represented in the Longitudinal Analyses**

AFSC	Career Ladder	Time 1 Survey		Time 2 Survey		Months Between Surveys	Time 1/Time 2 Matched N	
		Date	N	Date	N		Total	First-Term
301X1	Aircraft Electronic Navigation Equipment	Mar 68	979	Jun 71	1,280	39	185	39
301X4	Inertial and Radar Navigation Systems	Nov 67	779	Aug 71	1,188	45	170	50
325X0	Auto Flight Control Systems	Apr 68	307	Aug 71	1,057	40	190	29
421X3	Aerospace Ground Equipment	Mar 67	1,020	Oct 70	1,422	43	125	22
46XX0	Munitions and Weapons[a]	Oct 67	1,971	Mar 71	2,679	41	158	46
571X0	Fire Protection	Apr 68	1,688	Oct 71	1,563	42	127	22
671XX	Accounting and Disbursement[b]	May 67	845	Jan 70	1,876	32	251	104
							1,206	312

[a]461X0, Munitions Maintenance, and 462X0, Weapons Mechanic career ladders combined.

[b]671X1, Accounting Specialist, and 671X3, Disbursement Accounting Specialist career ladders combined.

Results and Discussion

Predicted job attitude values for cross-sectional and longitudinal samples were developed using a regression model for each job attitude by career ladder. Within ladder comparisons are made of the plotted values to determine if longitudinal interpretations of the Time 1 cross-sectional samples are supported by the longitudinal data. As will be explained, the Time 2 cross-sectional profiles are necessary to aid interpretation of the longitudinal data.

Figures 5 through 11 present the predicted attitude scores for the seven specialties. For each of the two attitude measures, regression lines for the Time 1 and Time 2 cross-sectional samples are presented on the left of the figures and for the longitudinal sample on the right. A dashed line is used to project the attitude level of airmen in their 49th month from the Time 1 sample onto the longitudinal sample. The regression model of the general form shown previously was used to generate the predicted values. However, the squared terms were removed from all model applications except for the 421X3 Time 1 and Time 2 total sample profiles because the squared terms did not add significantly to prediction of the criteria. Also, the average aptitude of the longitudinal sample was used for establishing all profiles within each career ladder. For example, the job interest profiles in Figure 5 are the plotted predicted values for all Inertial and Radar Navigation Systems Repairman in the Time 1, Time 2 or longitudinal samples who have an AV AI of 73.12.

A few common characteristics of the ladder profiles should be noted. For each specialty Time 1 sample profile and Time 2 sample profile, there is a decrease in predicted airmen attitudes from the 5th to the 48th month, a positive jump from the 48th to the 49th month, and a stable or slight positive acceleration in attitudes from the 49th to the 100th month. The slight 5th to 48th month positive acceleration of the Time 1 utilization profile for the 571X0 ladder (Figure 11) is the only exception. In all cases, the Time 2 cross-sectional attitude levels are substantially more negative than at Time 1. These Time 1/Time 2 attitude differences may be, among other explanations, a reflection of general attitude trends, a

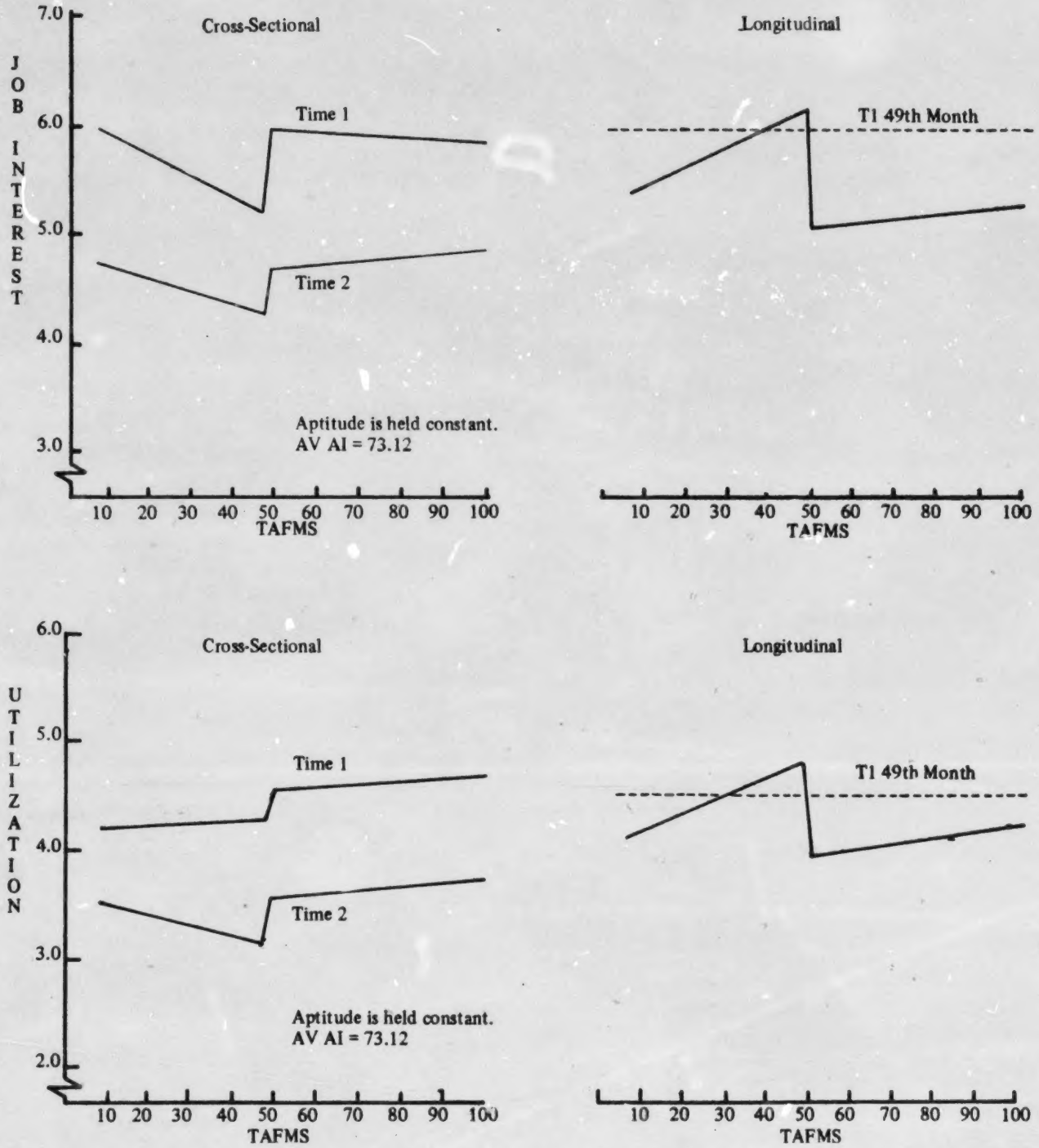

Figure 5. Cross-sectional and longitudinal job attitude/TAFMS relationships for the inertial and radar navigation systems (301X4) career ladder.

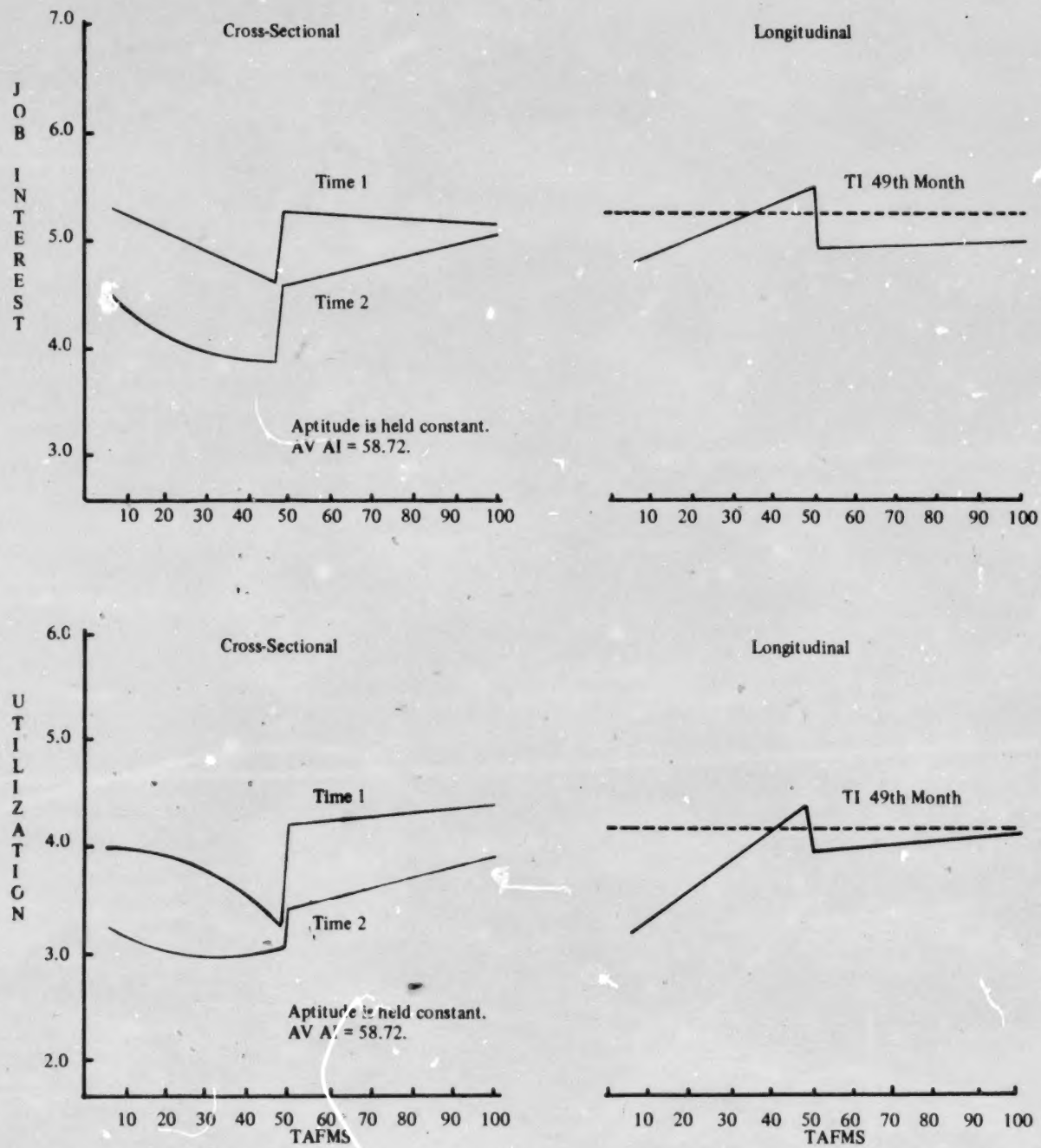

Figure 6. **Cross-sectional and longitudinal job attitude/TAFMS relationships for the aerospace ground equipment (421X3) career ladder.**

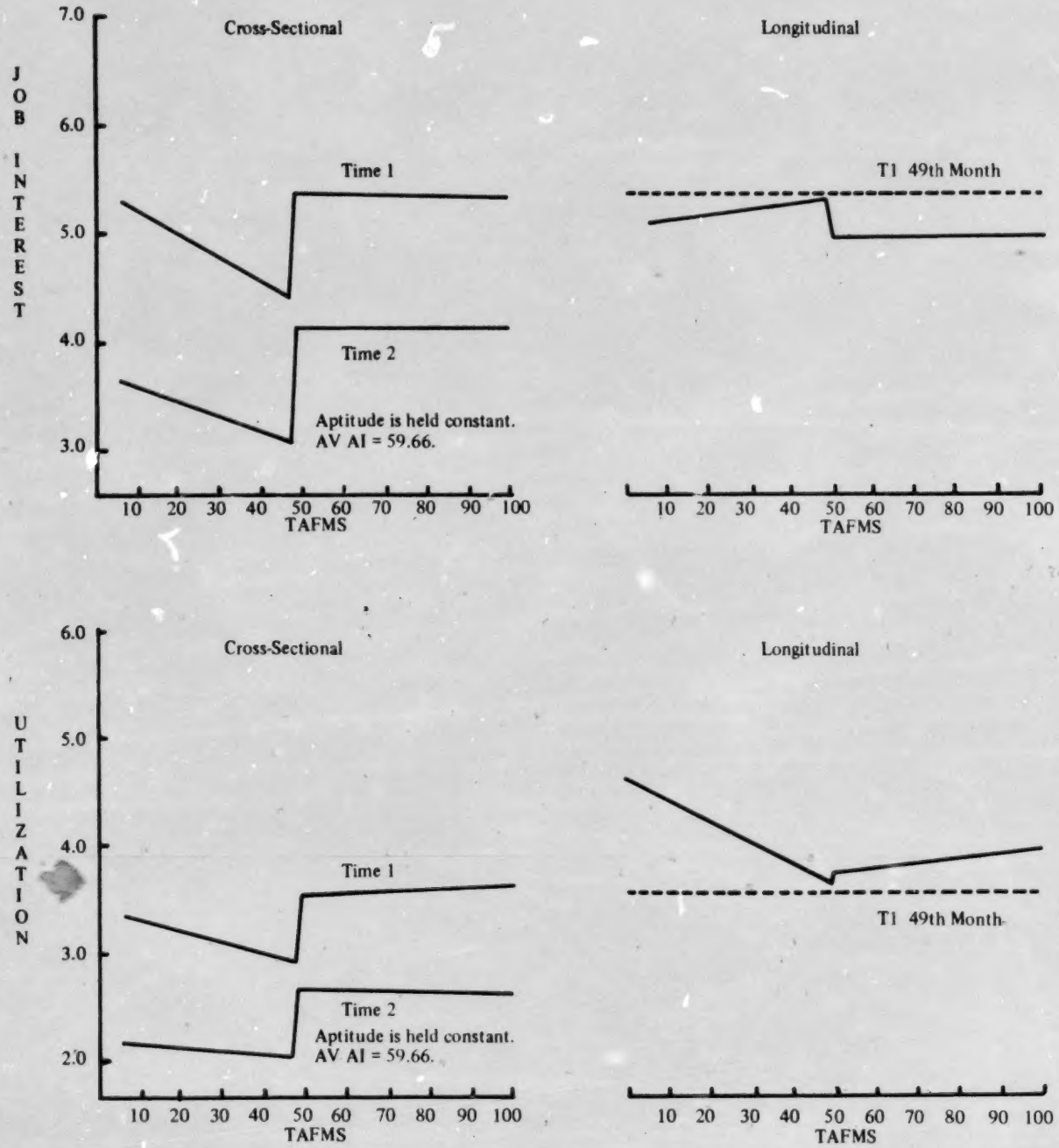

Figure 7. **Cross-sectional and longitudinal job attitude/TAFMS relationships for the munitions and weapons (46XXX) specialties.**

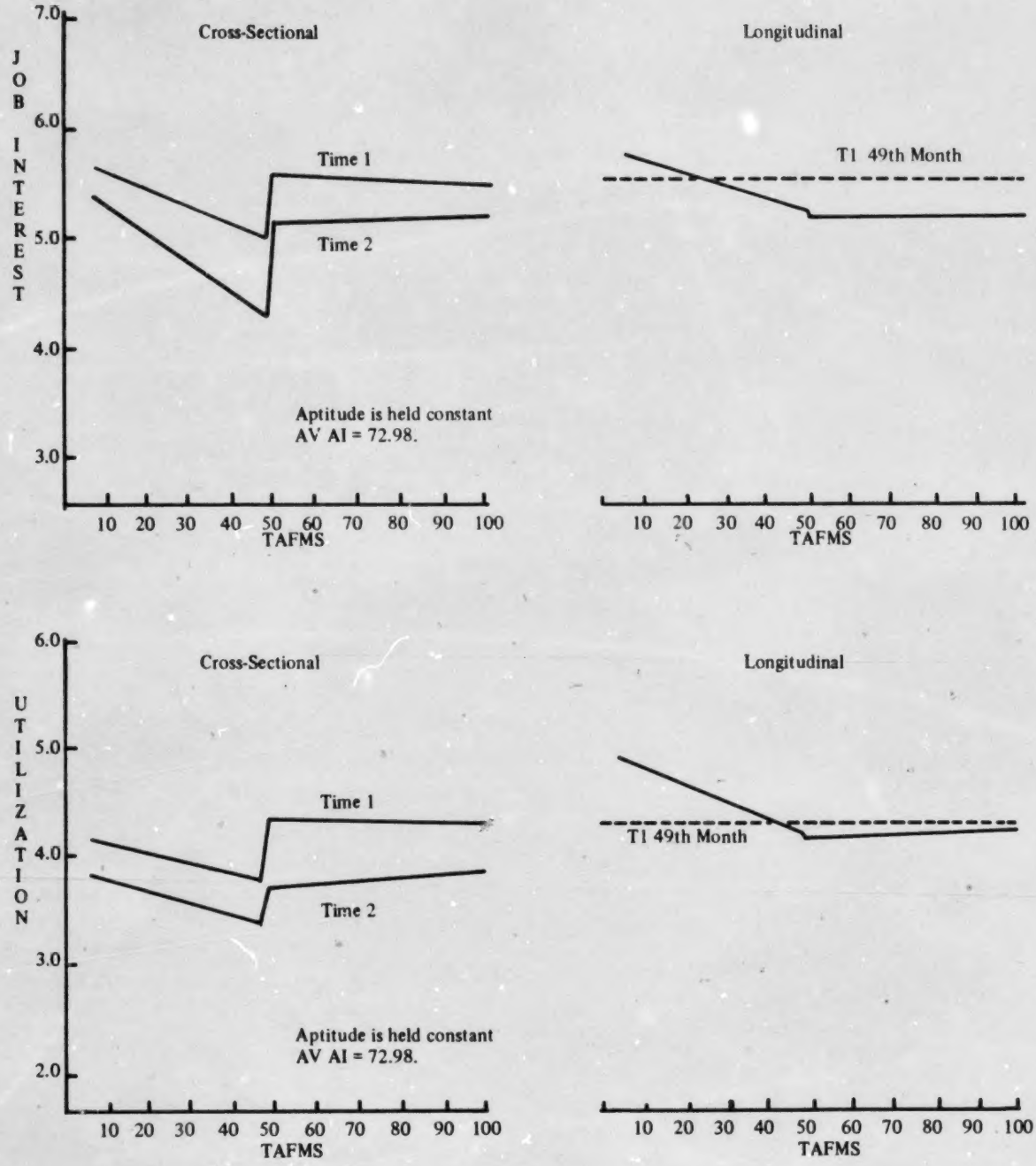

Figure 8. **Cross-sectional and longitudinal job attitude/TAFMS relationships for the aircraft electronic navigation equipment (301X1) career ladder.**

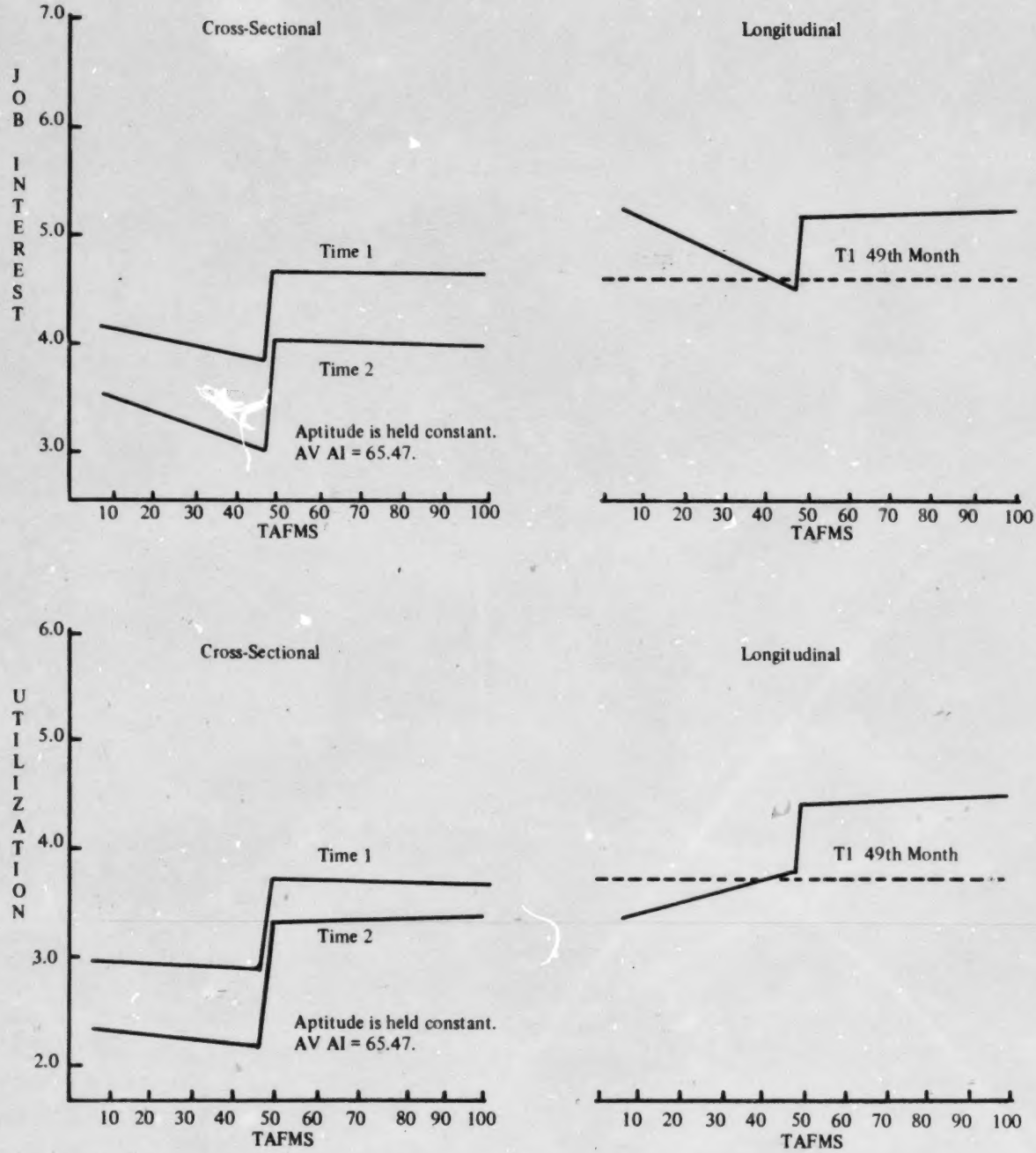

Figure 9. **Cross-sectional and longitudinal job attitude/TAFMS relationships for the accounting and disbursement (671XX) specialties.**

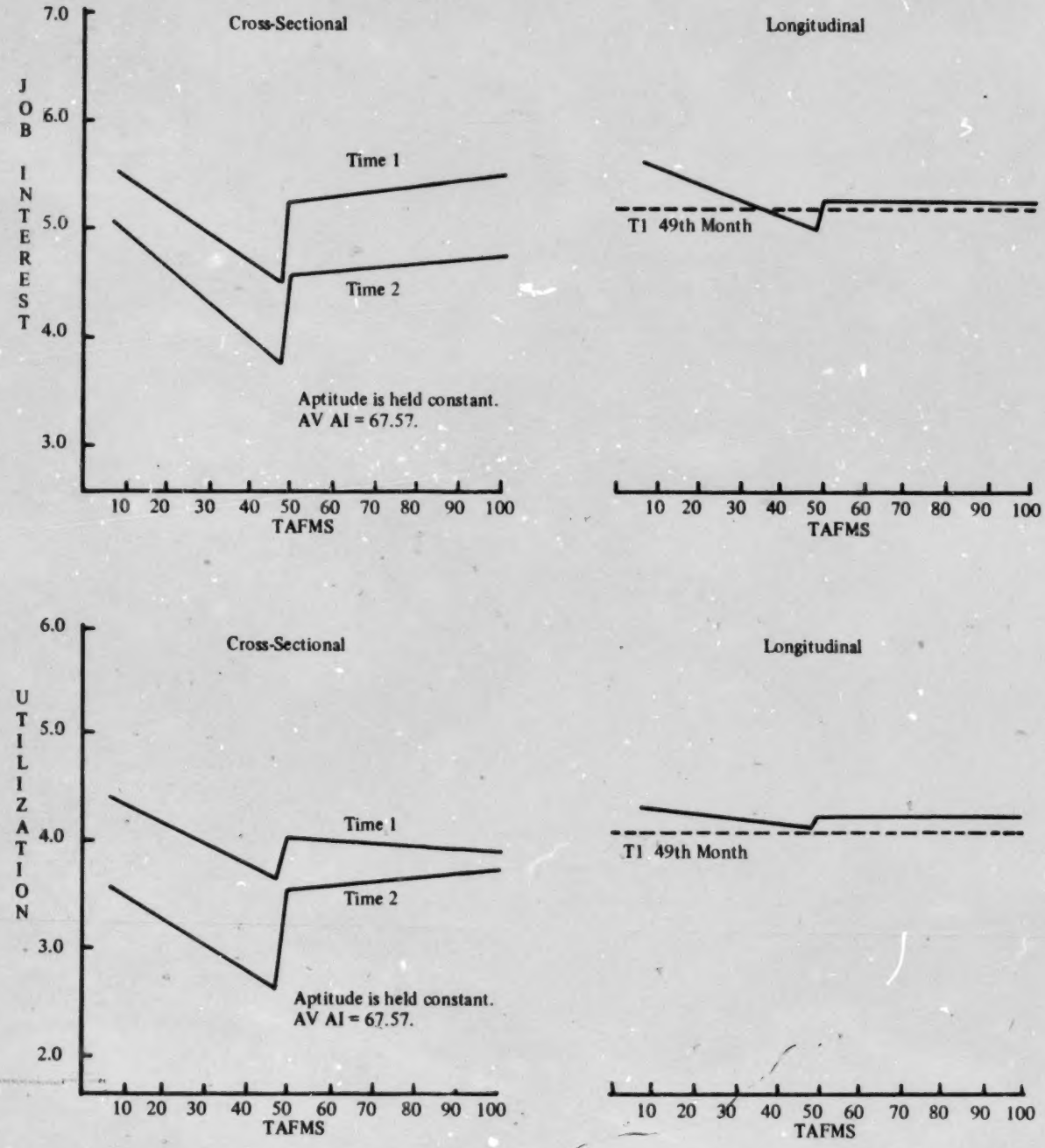

Figure 10. **Cross-sectional and longitudinal job attitude/TAFMS relationships for the auto flight control systems (325X0) career ladder.**

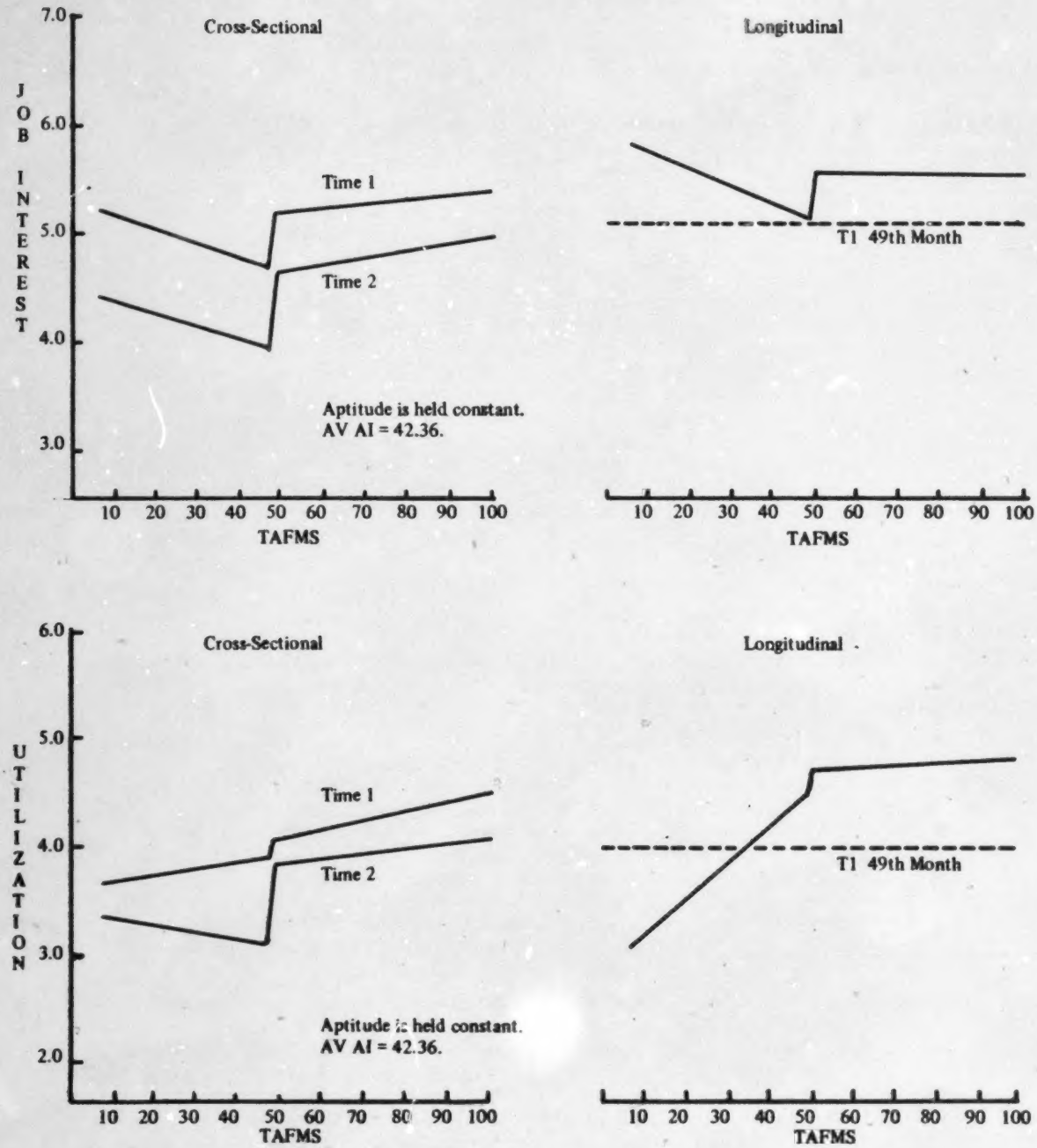

Figure 11. **Cross-sectional and longitudinal job attitude/TAFMS relationships for the fire protection (571X0) career ladder.**

greater willingness for Air Force personnel to express dissatisfaction as a result of recent "tell it like it is programs," or airmen may be expecting more from their jobs. Recent popular media and professional journals have reported dramatic increases in job dissatisfaction in the civilian sector (Watson & Zumbro, 1976). Since 1966, 29 Air Force career ladders have been surveyed twice at approximately 3-year intervals and there have again been consistent increases in reports of job dissatisfaction. Using 1,206 of the same cases included in this study and analysis of variance, Hickerson, Hazel, and Ward (1975) report that all Time 1/Time 2 attitude changes have been negative and that the changes are significant ($p < .05$). Although unexplained at this point, reported job attitudes of airmen are becoming increasingly more negative. These real time shifts or trends in job attitudes make interpretation of longitudinal responses difficult at best.

The basic question of this study is, can cross-sectional data be validly displayed and interpreted in a longitudinal fashion, particularly for first-term airmen? Or, do the attitudes of first-term airmen who subsequently reenlist become similar to those of career airmen as the reenlistment decision point is reached? The answer to both questions is an unqualified yes. Study the longitudinal profiles on the right sides of Figures 5 through 11. Without exception, as the 48th month career decision point is approached, the attitudes of the first-term airmen in the longitudinal sample approached or exceeded those of the Time 1 sample career airmen who are at the 49th month, represented by the dotted lines. For the first-term airmen of the longitudinal sample, reported job satisfaction is more positive and is increasing or is not decreasing from initial levels as rapidly as the cross-sectional, first-term airmen sample. While the total survey sample profiles show a characteristic decrease in reported job attitude with increased experienced for first-term airmen, the profiles for those who eventually reenlist generally show an increase in job attitude. It may be that those airmen whose jobs expand (vertical enlargement) as they gain experience, become increasingly more satisfied with their jobs and tend to reenlist. Meanwhile, those airmen whose jobs do not expand sufficiently become more dissatisfied and tend to separate from the service. There is evidence that first-term airmen jobs tend to be static and do not provide progression commensurate with experience. A study of first-term airmen in 11 career ladders (Wiley, 1972) reported that on-the-job experience was able to account for only 1 to 5 percent of the variance in numbers of tasks performed, average task difficulty scores, and composite job difficulty. Ladders with limited job progression are certainly good candidates for job reengineering, particularly if they have reenlistment shortages.

Striking attitude changes do exist for the longitudinal samples. The changes in attitudes during the Time 1/Time 2 interval are shown by the jump between the 48th and 49th month. However, in most cases the attitudes show a drop after the 48th month. The Time 2 job attitudes for the longitudinal samples have generally decreased during the approximate 3-year interval, often dramatically, in line with general trends of reports of decreased job attitudes (Watson & Zumbro, 1976).

Lower reported job attitude after reenlistment is in direct opposition to "cognitive dissonance theory" predictions. The longitudinal profiles in Figure 9 are prominent exceptions to the general attitude drop after the 48th month for the longitudinal sample. Minor increases are also seen in Figures 10 and 11. Note that for these three ladders, the reported attitude scores of the career airmen in the longitudinal sample actually exceed the attitude scores for the career airmen in even the Time 1 total sample while the attitudes of the Time 2, total sample are lower. This provides a clue for explaining why the longitudinal sample change from the 48th to the 49th month is positive for these three ladders while it is negative for the other five ladders. In the other five ladders, the regression lines for the longitudinal career airmen approximate the mean between the attitudes of career airmen in the Time 1 and Time 2 cross-sectional samples. This averaging effect seems reasonable since both Time 1 and Time 2 responses are represented in the greater than 48 month regression lines of the longitudinal samples.

The probable explanation for the 325X0, 571X0, and 671XX samples divergent longitudinal career attitudes is that the mean TAFMS values for the respective Time 1 cross-sectional career airmen samples are 92, 98, and 82 months while the mean TAFMS values for the respective longitudinal career airmen samples are 156, 156, and 143 months. The differences of 64, 58, and 61 months greatly exceed the Time 1/Time 2 survey intervals of 40, 42, and 32 months. For some unexplained reason, these three longitudinal samples have a high number of extremely experienced airmen. Since TAFMS has been found to be positively related to attitude for career airmen and based on the excessively high mean TAFMS of these career airmen, the attitudes would be predicted to be higher as reflected in the obtained profiles. Although the profiles show predicted attitudes for only the 5th through 100th month, airmen with up to 360 months (30 years) were

included in the sample and regression lines were merely truncated at the 100th month for display purposes. The absence of lesser experience career airmen in the three longitudinal samples may be due to excessive losses of talented, particularly second-term, airmen as were noted by Gould and Christal (1971) for the 671XX specialty.

Interpretations of longitudinal changes in job attitudes are very difficult because of the effects which unidentified historical variables may have on the attitudes during the intervals between data collections. Because such effects may be substantial, perhaps it is actually less risky to make longitudinal interpretations from cross-sectional data than it is to try to collect and interpret Time 1/Time 2 job attitude responses of longitudinal samples. Findings presented here show that job attitudes do change with tenure and that profiles displaying tenure/attitude relationships from cross-sectional data are almost exactly replicated by random samples drawn from the same population with a time interval of several years. However, although the nature of the relationships tend to be stable, the basic level of the job attitudes change; currently they have been decreasing. During the first enlistment, job attitudes of most airmen decrease but those airmen who later reenlist tend to report increasingly positive job attitudes with tenure or, at best, attitudes which are not decreasing as much as the entire first-term airmen sample. The actual nature of job attitude and career decision or tenure relationships differ by career ladder as do the basic attitude levels. Each of the seven career ladders included in this study appear to be good candidates for in-depth satisfaction research and job reengineering. The deceleration in first-term airmen job attitudes and subsequent attitude/career decision relationships suggest that job progression is generally not adequate and that interventions producing job progression for more of the airmen incumbents could result in a more satisfied airman population and more airmen desiring to reenlist.

V. CONCLUSIONS

A regression model which takes into account airmen career status and months of service while holding constant aptitude differences can be used to display cross-sectional attitude data in a longitudinal fashion. From the displayed regression profiles, it is feasible to infer career-ladder relationships between job attitudes and tenure or career decisions. A characteristic increase in job attitude immediately after the reenlistment decision point in cross-sectional data reflects a "residualization process" whereby those dissatisfied with their jobs tend to leave the Air Force while more satisfied airmen remain. The increase reflects the impact of job attitude on career decisions and is not due to alternative "dissonance theory" or changes in intrinsic motivation explanations. The cross-sectional profiles provide a means of identifying specialties with the greatest potential for job reengineering where the goal is to positively improve retention through providing progressively more satisfying jobs.

REFERENCES

Alley, W.E., & Gould, R.B. *The feasibility of estimating personnel turnover from survey data - a longitudinal study.* AFHRL-TR-75-54, AD-A018 777. Lackland AFB, TX: Personnel Research Division and Occupational and Manpower Research Division, Air Force Human Resources Laboratory, October 1975.

Bottenberg, R.A., & Ward, J.H. *Applied multiple linear regression.* PRL-TDR-63-6, AD-413 128. Lackland AFB, TX: Personnel Research Laboratory, Aerospace Medical Division, March 1963.

Broedling, L., Wiskoff, M., & Herbert, J. *Longitudinal studies of attitude change: Issues and methods.* NPROC Special Report 75-9. San Diego, CA: Navy Personnel Research and Development Center, April 1975.

Christal, R.E. *The United States Air Force occupational research project.* AFHRL-TR-73-75, AD-774 574. Lackland AFB, TX: Occupational Research Division, Air Force Human Resources Laboratory, January 1974.

Festinger, L. *A theory of cognitive dissonance.* New York: Harper & Row, 1957.

Freidlander, F. Motivations to work and organizational performance. *Journal of Applied Psychology,* 1966, **50**, 143–152.

Gould, R.B. Review of Air Force job satisfaction research. Paper presented at 82nd Annual Convention of American Psychological Association. New Orleans, LA, August 1974. Abstract in *Resources in Education,* May 1975, 47. Paper available from ERIC; Accession Number ED 099 753.

Gould, R.B. *Reported job interest and perceived utilization of talents and training by airmen in 97 career ladders.* AFHRL-TR-72-7, AD-745 099. Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, January 1972.

Gould, R.B., & Christal, R.E. Enlisted job satisfaction in the Air Force: A study at the task level. In *Proceedings: 13th Annual Conference of the Military Testing Association.* U.S. Marine Corps, Washington, D.C., 20–24 September 1971, 323–333.

Hickerson, K.A., Hazel, J.T., & Ward, J.H. *A causal analysis of relationships between performance and satisfaction in eight airman specialties.* AFHRL-TR-75-57, AD-A020 542. Lackland AFB, TX: Occupational and Manpower Research Division, Air Force Human Resources Laboratory, October 1975.

Stacy, W.J. *Felt utilization of talent and training in two civil engineering career ladders.* AFHRL-TR-73-32, November 1973. (This reference is available to qualified military or government requestors from AFHRL/ORE, Lackland Air Force Base, Texas 78236.)

Stacy, W.J., & Hazel, J.T. *A method of determining desirable task experiences for first-line supervisors.* AFHRL-TR-75-23, AD-A017 471. Lackland AFB, TX: Occupational and Manpower Research Division, Air Force Human Resources Laboratory, August 1975.

Tuttle, T.C., & Hazel, J.T. *Implications of job satisfaction and work motivation theories for Air Force research.* AFHRL-TR-74-56, AD-781 035. Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, January 1974.

Vitola, B.M., Mullins, C.J., & Brokaw, L.D. *Comparative data on a sample of all-volunteer enlistees with 1970 through 1972 Air Force assessions.* AFHRL-TR-73-26, AD-767 579. Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, July 1973.

Watson, T.W., & Zumbro, P.A. *A review and evaluation of job enrichment with implications for Air Force job redesign research: Includes annotated bibliography of job enrichment and related literature.* Lackland AFB, TX: Occupational and Manpower Research Division, Air Force Human Resources Laboratory, in press.

Wiley, L.N. *Analysis of the difficulty of jobs performed by first-term airmen in 11 career ladders.* AFHRL-TR-72-60, AD-757 876. Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, July 1972.

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